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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/521,412	04/29/2005	Andrew Edward Feiring	SR0015USPCT	9054

7590 06/21/2006

E.I. du Pont de Nemours and Company  
Legal - Patents  
Wilmington, DE 19898

EXAMINER
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WU, IVES J

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 06/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/521,412

Applicant(s)

FEIRING ET AL.

Examiner

Ives Wu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 April 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

(1). Applicants' Amendments and Remarks filed on April 28, 2006 have been received and acknowledged.

Claims 1, 17 and 22 are amended. Claim 2 is cancelled.

The rejection of claim 2 in the prior Office Action dated March 15, 2006 is removed in response to the cancellation in Applicants' Amendments filed on April 28, 2006.

The rejections of claims 1, 9, 15-17 and 22 in the prior Office Action dated March 15, 2006 are modified and presented with rest claims in the following paragraphs.

#### *Claim Rejections - 35 USC § 103*

(2). The text of those Section Title 35 U.S. Code not included in this Office Action can be found in the prior Office Action dated March 15, 2006.

(3). **Claims 1, 3-8, 10-14 and 18-28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Feiring et al (WO00/67072) in view of Nishimura et al (US006838225B2).

(4). As to the component A in the fluorine-containing copolymer in **independent claim 1**, Feiring et al (WO 00/67072) disclose the fluorinated polymers, photoresists that involve a fluoroalcohol functional group may have structure:  $-XCH_2C(R_f)(R'_f)-OH$ , wherein  $R_f$  and  $R'_f$  are the same or different fluoroalkyl groups of from 1 to about 10 carbon atoms or taken together are  $(CF_2)_n$ , where n is 2 to 10; X is selected from the group consisting of oxygen, sulfur, nitrogen, phosphorous (page 13, line 3-10).

As to the component B in the fluorine-containing copolymer in **independent claim 1**, Feiring et al (WO 00/67072) **do not teach** the 2<sup>nd</sup> repeat unit derived from  $CH_2 = CRCO_2R''$  wherein R is H, F or a  $C_{1-5}$  alkyl or fluoroalkyl group;  $R''$  is a polycyclic  $C_{5-50}$  alkyl group containing at least one hydroxyl group.

However, Nishimura et al **teach** a radiation-sensitive resin composition comprising (Abstract, line 1): one or more recurring units from mono-functional monomers which include 3-hydroxyadamantyl (meth)acrylate (Col. 14, line 37-39).

The advantage of using mono-functional monomers to form the resins is to provide a radiation-sensitive resin composition useful as a chemically amplified resist having high

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transmittance of radiation and exhibiting superior basic properties as a resist such as high sensitivity, resolution, dry etching tolerance, and pattern shaper (Col. 3, line 7-12).

Therefore, it would have been obvious at time the invention was made to include the monomers of hydroxyadamantyl acrylate taught by Nishimura et al in the photoresist compositions of Feiring et al in order to obtain the above-mentioned advantage.

As to the limitation of **claim 3**, Nishimura et al disclose a radiation-sensitive resin composition comprising (Abstract, line 1): one or more recurring units from mono-functional monomers which include 3-hydroxyadamantyl (meth)acrylate (Col. 14, line 37-39).

(5) As to the repeat unit of 2-methyl-2-adamantyl acrylate in **dependent claim 4**, Feiring et al disclose examples of components having protected acidic groups that yield an acidic group as hydrophilic group upon exposure to photogenerated acid include, but not limited to, A) esters such as 2-methyl-2-adamantyl ester (page 15, line 1-3, 14-15). It is well known that acrylate is ester.

As to limitation of **dependent claim 5**, it is noticed that instant claim is product-by-process claim, although prepared in a different manner, appeared to be the same as the claimed product. *In re Thorpe*, 227 USPQ 964 (CAFC 1985).

As to the limitation of **dependent claims 6,7 and 18**, Feiring et al disclose some representative examples of ethylenically unsaturated compounds and their corresponding repeat units are tetrafluoroethylene (page 12, line 17-20).

As to limitation of **dependent claim 8**, Feiring et al disclose a repeat unit derived from an ethylenically unsaturated compound comprised of a fluoroalcohol functional group having structure:  $-C(R_f)(R_f')-OH$  (page 6, line 23-30).

As to limitation of **dependent claim 10**, Feiring et al disclose the fluorinated polymers, photoresists involving a fluoroalcohol functional group having the structure:  $-XCH_2C(R_f)(R_f')-OH$ .

As to limitation of **dependent claims 11 and 12**, Feiring et al disclose the resulting protected fluoroalcohol group having the structure:

$-C(R_f)(R_f')O-CH_2OCH_2R_5$  (page 15, line 29 - page 16, line 5).

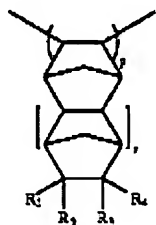
As to limitation of **dependent claim 13**, Feiring et al disclose the structure:

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$-\text{C}(\text{R}_f)(\text{R}_f')-\text{OH}$  wherein  $\text{R}_f$  and  $\text{R}_f'$  are the same or different fluoroalkyl groups of from 1 to about 10 carbon atoms (page 7, line 9-18).

As to the limitation of **dependent claim 14**, Feiring et al disclose, in still another embodiment, the fluorinated polymer comprising the structure:

In still another embodiment, the invention is a fluorine-containing polymer comprising the structure:



wherein each of  $\text{R}_1$ ,  $\text{R}_2$ ,  $\text{R}_3$ , and  $\text{R}_4$  independently is hydrogen, a halogen atom, a hydrocarbon group containing from 1 to 10 carbon atoms, a substituted hydrocarbon group, an alkoxy group, a carboxylic acid, a carboxylic ester or a functional group containing the structure:



(page 9, line 1-16).

As to the component A in a photoresist in **independent claim 19**, the disclosure of Feiring et al (WO 00/67072) and Malik et al (US20030022097A1) is incorporated herein by reference, the most subject matters of component Ai and Aii as claimed has been recited in applicant's claim 1, and has been discussed in paragraph (2).

As to the photoresist in **independent claim 19**, Feiring et al disclose the embodiments comprising a photoresist (page 3, line 33).

As to the component B, at least one photoactive component in **independent claim 19**, Feiring et al disclose photoactive component (page 14, line 10).

As to the limitation of **dependent claim 20**, Feiring et al disclose dissolution inhibitors and additives (page 16, line 19).

As to the limitation of **dependent claim 21**, Feiring et al disclose a solvent (page 10, line 32).

(6) As to the coatable photoresist composition in 1<sup>st</sup> step of a process for preparing a photoresist composition in **independent claim 22**, the disclosure of Feiring et al (WO 00/67072) and Nishimura et al (US006838225B2) is incorporated herein by reference, the most subject

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matters of a fluorine-containing copolymer, a photoactive component and a solvent as claimed, has been recited in applicant's claims 1, 19 and 21, and has been discussed in paragraph (4-5).

(7). As to the 1<sup>st</sup> step of applying a coatable photoresist composition on a substrate in **independent claim 22**, Feiring et al disclose in another embodiment, the invention is a process for preparing a photoresist image on a substrate comprising: applying a photoresist composition on a substrate (page 10, line 9-11).

As to the coatbale photoresist composition in 1<sup>st</sup> step in **independent claim 22**, the disclosure of Feiring et al and Nishimura et al meets the requirements of the present claim both in terms of the types of materials added and their contents. It is reasonable to presume that the composition of the references would also be coatable photoresist as presently claimed in light of its chemical similarities.

As to 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> steps of the process in **independent claim 22**, Feiring et al disclose step of drying the photoresist composition to substantially remove the solvent and thereby form a photoresist layer on the substrate, step of imagewise exposing the photoresist layer to form imaged and non-imaged areas, and step of developing the exposed photoresist layer having imaged and non-imaged areas to form the relief image on the substrate (page 11, line 6).

(8). As to the limitation of **dependent claim 23**, Feiring et al disclose the structure:  $-C(R_f)(R_f')-OH$  wherein  $R_f$  and  $R_f'$  are the same or different fluoroalkyl groups of from 1 to about 10 carbon atoms (page 7, line 9-18).

As to the limitation of **dependent claim 24**, Feiring et al disclose preferably, the functionality to be acid or protected acid such that aqueous development is possible using a basic developer such as sodium hydroxide solution, potassium hydroxide solution (page 18, line 20-21).

As to the limitation of **dependent claims 25-27**, Feiring et al disclose During development using either a critical fluid or an organic solvent (page 19, line 8). Carbon dioxide may be used for the critical fluid . Various organic solvents can also be used as developer in the patentee's invention. These include, but are not limited to, halogenated solvents and non-

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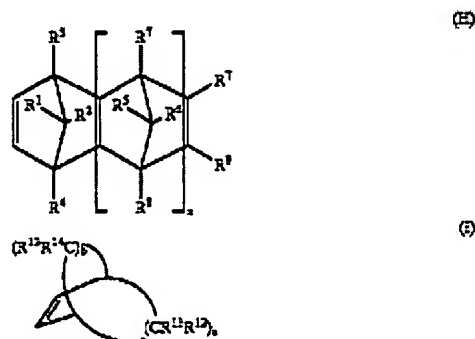
halogenated solvents. Halogenated solvents are preferred and fluorinated solvents are more preferred (page 19, line 14-18).

As to the limitation of **dependent claim 28**, Feiring et al disclose preparing a photoresist image on a substrate (page 8, line 7-8) where the substrate can illustratively be a silicon, silicon oxide or various materials used in semiconductive manufacture (page 19, line 20-22).

(9). **Claims 15-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Feiring et al (WO 00/67072) in view of Nishimura et al (US006838225B2), and further in view of Feiring et al (WO 00/17712).

As to the repeating units from cyclic or polycyclic compounds represented by the structures (H) or (I) in **dependent claim 15**, cyclic or polycyclic unsaturated compounds in **dependent claims 16 and 17**, both Feiring et al and Nishimura et al **do not teach** compound with these structures as claimed.

However, Feiring et al (WO 00/17712) **teach**, in one preferred embodiment, at least one ethylenically unsaturated compound to be selected from the group consisting of:

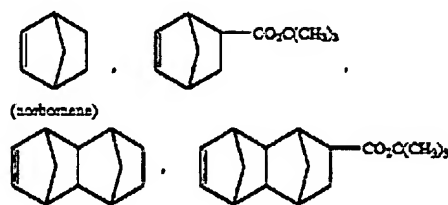


wherein n is 0, 1 or 2; a and b are independently 1 to 3 except that a is not = 1 when b = 2 or vice versa;  $R^1$  to  $R^{14}$  are the same or different and each represents a hydrogen atom, a halogen atom, a carboxyl group, a  $C_{1-14}$  secondary or tertiary alkyl carboxylate, a hydrocarbon group or a substituted hydrocarbon group (page 4, line 1-8).

Representative comonomers having structure H include, but are limited to:

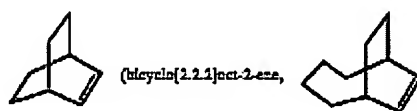
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Representative comonomers having structure H include, but are not limited to:



(page 13, line 3-6).

Representative comonomers having structure I include, but are not limited to:



(page 13, line 8-12).

The advantages of using cyclic or polycyclic unsaturated compounds recited hereinabove is to have high transparency in the extreme/far UV as well as the near UV, high plasma etch resistance, and are useful for microlithography in the extreme, far, and near UV region, particularly at wavelengths  $\leq 365$  nm (Abstract, line 9-11).

Therefore, it would have been obvious at time the invention was made to include the monomers of cyclic or polycyclic unsaturated compounds of Feiring et al (WO 00/17712) in the photoresist composition of Feiring et al (WO 00/67072), Nishimura et al (US006838225B2) in order to obtain the above-mentioned advantages.

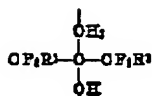
(10). **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Feiring et al (WO 00/67072) in view of Nishimura et al (US006838225B2), and further in view of Adelman (US003444148).

As to the limitation of **dependent claim 9**, both Feiring et al and Nishimura et al **do not teach** the functional group  $-(CH_2)C(R_f)(R_f')-OH$ .

However, Adelman teaches solid film-forming copolymers of at least one of certain terminally unsaturated polyfluorinated alcohols such as  $CH_2=C(R)-CH_2-C(CF_2R^1)(CF_2R^2)-OH$  in which R is hydrogen, lower alkyl and  $R^1$  and  $R^2$  are, separately fluorine, lower perfluoroalkyl (Abstract, Col. 1, line 39-48).. It will be seen that, in the copolymers, the fluoroalcohol groups:



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are always and exclusively present as side chain, or pending groups (Col. 5, line 69 – Col. 6, line 2).

The advantage of using this functional groups is actually to impart enhanced properties not found in homopolymer or copolymers of ethylenic compounds reacted therewith such as heat distortion (Col. 6, line 40-53).

Therefore, it would have been obvious at time the invention was made to include The fluoroalcohol functional group of Adelman as a repeat unit in a fluorine-containing copolymer of Feiring et al in order to obtain the above-mentioned advantage.

### ***Response to Arguments***

(11). Applicant's arguments with respect to claims 1-28 have been considered but are moot in view of the new ground(s) of rejection.

Applicants further raise the issue about the data shown in Table 3 in the prior art reference of Nishimura et al (US006838225B2) in which illustrates the test results of example 3,7 and 1,6. Because they are unpredictable in terms of sensitivity, radiation transmittance, therefore, there is no reason to assume or expect that 3-hydroxyadamantyl acrylate in the photoresist compositions of Feiring et al would confer any particular advantage. Although Nishimura et al (US006838225B2) present results of 12 examples to compare with the results of example without using 2-methyl-2-adamantyl methacrylate and 3-hydroxyadamantyl acrylate, it is sufficient to prove that the difference made by using 2-methyl-2-adamantyl methacrylate and 3-hydroxyadamantyl acrylate as claimed by patentees. As to the amount of these two acrylates used in the photoresist composition of Nishimura et al (US006838225B2), Nishimura et al (US006838225B2) are silent without analysis of their individual effects on the radiation transmittance, sensitivity as well as resolution. In general, the advantages of using those two acrylates are well demonstrated.

### ***Conclusion***

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Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ives Wu whose telephone number is 571-272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu  
Art Unit: 1713  
Date: June 17, 2006



DAVID W. WU  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700